The effects of the food gap and changes in agricultural price policies on wheat consumption in Iraq from the year (1995 to 2022)

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Abstract:

The aim of the research is to study and determine the food gap between production and consumption and verify the existence of a balanced relationship between the variables used in the long term, and then estimate the error correction model for wheat crop consumption according to the (ARDL) for the period (1995-2022), and co-integration is tested between the variables included in form Under study using the Bounds Test, The results showed the existence of a long-term balanced relationship between local consumption of the wheat crop and the independent variables. As for the results of the error correction test for the long- and short-term relationship, it showed that the parameters(Quantities produced x1, quantities imported x2, price of the competitive crop barley x3) It came with a positive and significant signal in the short and long term and is consistent with economic logic, as any increase in these independent variables will lead to an increase in consumption of this wheat crop, It turned out that the parameter of the independent variable, the world price (X4), was with a negative and significant sign in the short and long term, and this is consistent with economic theory, meaning an increase in the world price will lead to a decrease in the quantities consumed of the wheat crop. It turned out that the parameter of the variable, population size (X5), was with a wave sign, consistent with logic. Economic in the short term, but in the long term its sign has become negative (inverse), contrary to economic logic and not significant,The study recommends working to increase investment in the agricultural sector by granting soft agricultural loans, and the necessity of exploiting these loans in the field of wheat cultivation to increase agricultural production with the aim of reaching the stage of self-sufficiency and reducing imported quantities.

Keywords: wheat crop consumption, ARDL model, price policy

introduction:

Strategically and economically, wheat is the most important grain crop. It provides the majority of the world's food, particularly in Iraq, where its flour is used to make bread, pasta, pastries, and other food products. Apart from its nutritional value, which stems from the presence of essential elements like calcium, magnesium, potassium, iron, sodium, phosphorus, zinc, and others, it holds the top spot in terms of production and cultivated area, contributing to the goal of self-sufficiency. This particular crop is noteworthy for its significance as a fundamental food commodity that is relied upon by several elements of Iraqi society, particularly those with low or restricted typical incomes. Due to this, wheat has greater political and military significance than it does economic significance. The history of economic philosophy is replete with examples of The study's focus is on the fact that grain agreements have caused the downfall of certain nations [1], Even though Iraq has the necessary resources for agriculture, such as rich soil, water, and a temperate temperature, the country continues to face a chronic food shortage that becomes worse every day. It has

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grown the wheat crop for many years using the agricultural development approach, sometimes with direct government support and other times by providing tax and credit facilities. However, in order to address any deviations from the plan and create realistic expectations for future plans, the success of the agricultural development plan for this crop needs to be studied and evaluated.[2]

Research problem:

The research topic is plagued by a persistent rise in wheat crop consumption, and the price policy is beset with numerous issues that impact both the crop's production and consumption. Despite being a staple food, we discover that Iraq's production of wheat cannot keep up with the growing global demand and falls short of meeting the country's needs. The ongoing population growth means that it does not satisfy the actual needs of the consumer, which in turn causes consumption of this crop to rise and production to fall, creating a food gap between the amounts produced and eaten.

research importance:

The significance of price strategy in creating sensible and effective programs to achieve the maximum degree of wheat self-sufficiency accounts. This crop is regarded as one of the fundamental crops that are essential for human nutrition and animal feed

research aims:

The research aims to achieve several goals, including:

1 -Conducting an econometric analysis of the wheat crop consumption function through a number of factors that influence it in Iraq (1995-2022)

2- Verifying the existence of a balanced relationship between the study variables in the long term, then estimating the error correction for wheat crop consumption according to (ARDL) for the period (1995-202)

3-Study the reality of consumption of the wheat crop under study in Iraq (1995-2022), and determine the nutritional gap between production and consumption of this crop and the level of self-sufficiency

Research hypothesis:

The research hypothesis is to determine the impact of price policy on consumption of the wheat crop throughout the study period, and it is expected that Iraq will remain unable to achieve self-independence, which will lead to the formation of a food gap that expands annually and leads to increased consumption unless a new advanced price policy is implemented to fill it.

The first section: The theoretical framework

First: price policy

Price is seen as the driving force behind both consumer and production in a market economy, but in a planned economy, price is seen as one of the key variables that control both production and consumption. As a result, any increase in demand for goods and services leads to an increase in their prices, which in turn leads to higher profits, and inspires and motivates many to increase production and vice versa. Price changes affect the supply and demand for products and services until they reach equilibrium, which is determined by the equilibrium price[3].

Second: Objectives of price policy:

Prices and price policies play a crucial role in allocating resources among various production types and in distributing production among consumers. They also have an impact on the economic efficiency of resources and the equitable distribution of incomes. Furthermore, prices for agricultural products are subject to year-to-year and

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season-to-season fluctuations. Lastly, this calls for government action to modify prices and steer agricultural output toward objectives associated with economic development[4].

1 -Resolving the issues of crop competitiveness and the requirement to boost food production in order to accelerate self-sufficiency and decrease reliance on outside sources.

2 -Improving the standard of living for farmers by boosting output by recovering previously lost farmland or boosting the output of underutilized land.

3 -Increasing the import of hard money and producing an excess of agricultural output for export.

Third: The concept of food security, the food gap, and self-sufficiency

1-The concept of food security:

One of the fundamental elements of agricultural development is food security, which was included in plans for economic and social development. These plans included a range of projects and programs that aimed to increase food production through efficient use of resources, address cases of food spoilage and loss from producer to consumer, reduce food consumption in all its forms, establish guidelines for the exchange of goods and their production requirements, whether the goods are for import or export, and maintain environmental stability., and eradicating pollution in all its forms by fostering a great level of independence and lowering reliance. The objective is to consistently provide food supplies of adequate quality and quantity to every member of society and every area of habitation at costs commensurate with their incomes[5].

2-Nutrition gap:

The food gap expresses the inadequacy in local production to meet the needs of the nation, where that deficiency is secured through imports from abroad, and it includes food conditions according to national consumption habits. It symbolizes the difference between what is produced within the nation and what it needs for the purpose of food consumption. The difference in needs for agricultural products within a given time frame is referred to as the gap, and it is filled by importing the item from the producing countries[6]. It conveys the degree to which local food production can satisfy the needs of the local customer base; this shortfall is frequently filled by imports. The food gap is the difference between the total amount of food required and the total amount produced domestically; a larger gap suggests that the local economy is unable to meet societal demands[7].

Food gap = consumption - production

3-Self-sufficiency:

One of the best ways to raise the level of food security is to have a stock of strategically important basic foods that the nation can turn to in the event of a natural disaster. This is known as the self-sufficiency rate, which expresses the possibility of meeting the nation's food needs from its domestic product. which results in a decrease in output, or when the nation is unable to import the majority of the food it requires from outside[8].The ability of a nation to meet its residents' food demands entirely through domestic production is referred to as food self-sufficiency. The percentage of production to consumption is what it is called. Since prices and their fluctuations have no bearing on it, the measure's computation is based on quantities rather than values. As a result, the self-sufficiency rate provides a more accurate picture of the national food situation because it

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both captures the national food situation and the capacity of production to meet demand.[9[

The second section: The reality of consumption, the size of the food gap, and self-sufficiency in the wheat crop in Iraq for the period 1995-2022.

Table (1) Quantities produced and available for consumption, the food gap, the self-sufficiency rate of the wheat crop, and the rate of dependence on abroad in Iraq for the period (1995-2022)

Percentage of dependence on abroad(%) 6	Self-sufficiency rate 5(%)	Food gap (tons)4	Consumption (tons)3	Production (tons)2	Import quantity (tons)1	the years
30.546	69.4543	-480000	1571416	1091416	480000	1995
20.689	79.31032	-300000	1449998	1149998	300000	1996
67.598	32.40262	-1975000	2921711	946711	1975000	1997
61.243	38.83248	-2323160	3798029	1474869	2326000	1998
62.602	37.46724	-1838565	2940163	1101598	1840600	1999
75.379	24.62004	-3185200	4225526	1040326	3185200	2000
57.606	42.61776	-2988350	5207796	2219446	3000000	2001
48.439	51.88483	-2401331	4990798	2589467	2417464	2002
36.635	66.83792	-1155647	3484845	2329198	1276667	2003
61.052	44.71669	-2265075	4097213	1832138	2501412	2004
53.224	46.77618	-2535520	4763882	2228362	2535520	2005
55.444	44.65343	-2833813	5120124	2286311	2838813	2006
52.395	47.61823	-2423134	4625911	2202777	2423713	2007
70.249	29.75076	-2963320	4218295	1254975	2963320	2008
64.209	35.79166	-3050409	4750799	1700390	3050409	2009
40.287	59.71371	-1854525	4603365	2748840	1854525	2010
48.777	51.22346	-2674720	5483620	2808900	2674720	2011
44.197	55.80326	-2425381	5487692	3062311	2425381	2012
34.917	65.08316	-2241683	6420062	4178379	2241683	2013
18.217	81.78309	-1126009	6181120	5055111	1126009	2014
13.809	86.19189	-423744	3068805	2645061	423744	2015
5.424	94.57604	-175087	3228026	3052939	175087	2016
14.101	85.90662	-487921	3462057	2974136	488187	2017
46.232	53.76879	-1872578	4050462.8	2177885	1872604	2018
16.291	83.72607	-844154	5187153.5	4343000	845000	2019
14.6197	85.39089	-1067229	7305228.5	6238000	1068000	2020
22.963	77.04835	-1261251	5495251	4234000	1261870	2021
27.686	72.33402	-1057544	3822544.3	2765000	1058290	2022
41.600	58.76014	-1793941	4355781.9	2561841	1808186	Average
75.379	94.57604	-3185200	7305228.5	6238000	3185200	highest value

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5.424	24.62004	-175087	1449998	946711	175087	Lowest value

Source: Column (1 and 2) Ministry of Planning and Development Cooperation - Central Bureau of Statistics and Information Technology - Directorate of Agricultural Statistics, and Directorate of Population and Labor Force Statistics from (1995-2022). Columns (3, 4, 5, 6) were prepared by the researchers

By analyzing the data in Table (1), it was found that the consumption capacity of the wheat crop is at an increasing pace and is continuing to rise, as local production no longer meets the actual need for this crop due to the continuous increase in population numbers and is offset by the misuse of resources, as the highest level of consumption reached about (57,305,228) tons. The year (2020), and its lowest level (1,449,998) tons in (1996), with an overall average of (4,355,781.9) during the study period (1995 - 2022)

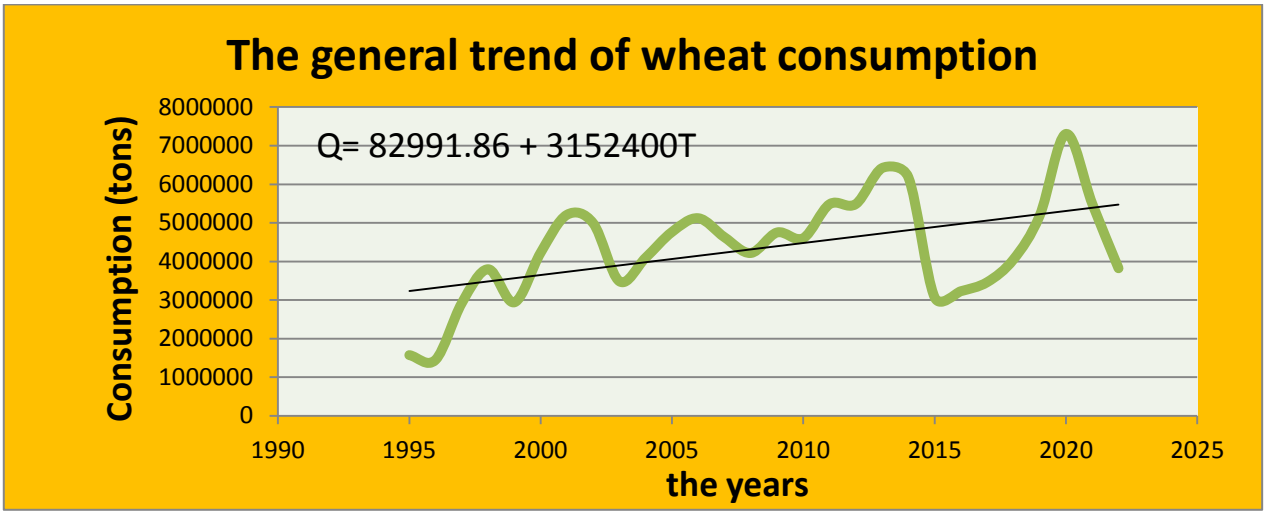

Figure (1): The general trend of wheat crop consumption in Iraq for the period (1995 - 2022)

It appears from the data of the table above that the lowest value of wheat imported amounted to (175,087) tons in 2016 due to the increase in the areas cultivated with wheat, which led to an increase in the quantities produced from it, as Iraq achieved an almost self-sufficiency rate during this year, which led to a decrease in quantities. The percentage of dependence on this crop was about (5.424%). As for the highest import quantity, it was estimated at about (3,185,200) tons in the year (2000), and the percentage of dependence on it was (75.379%). As for local production compared to the imported one, it was The highest local production was in the year (2020), reaching (6,238,000) tons, and in 1997, the lowest locally produced quantity of the wheat crop was (946,711) tons, and this decrease in production led to an increase in the imported quantity to (1,975,000) tons.

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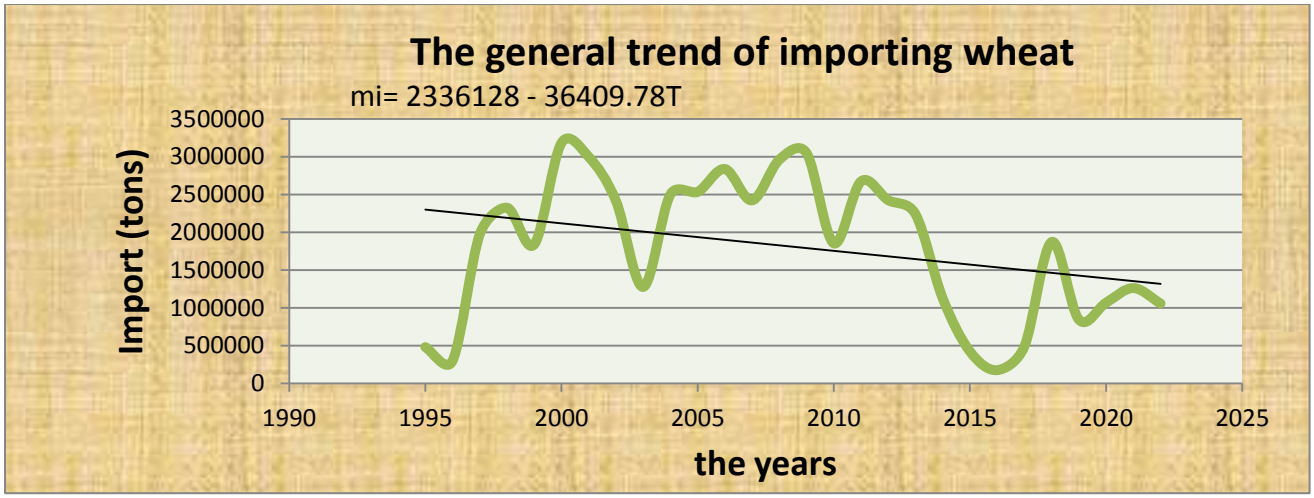

Figure (2): The general trend of wheat imports in Iraq for the period (1995 - 2022)

As for the size of the gap, it was negative for all years. This means that local production is less than consumption, as this gap is filled through imports from abroad. The size of the gap ranged between an upper limit for this crop of about (-3,185,200) tons in the year (2000), and this increase is due to To a decrease in the areas cultivated with the crop, as well as a decrease in productivity, climate changes, and migration from the countryside to the city, and between a minimum of (-175,087) tons in the year (2016), and this is due to the increase in the areas cultivated with the wheat crop, as well as the increase in productivity, which in turn depends on climate factors and improved seeds. In addition to some other factors, the average of this gap was about (-1,793,941) tons during the study period.

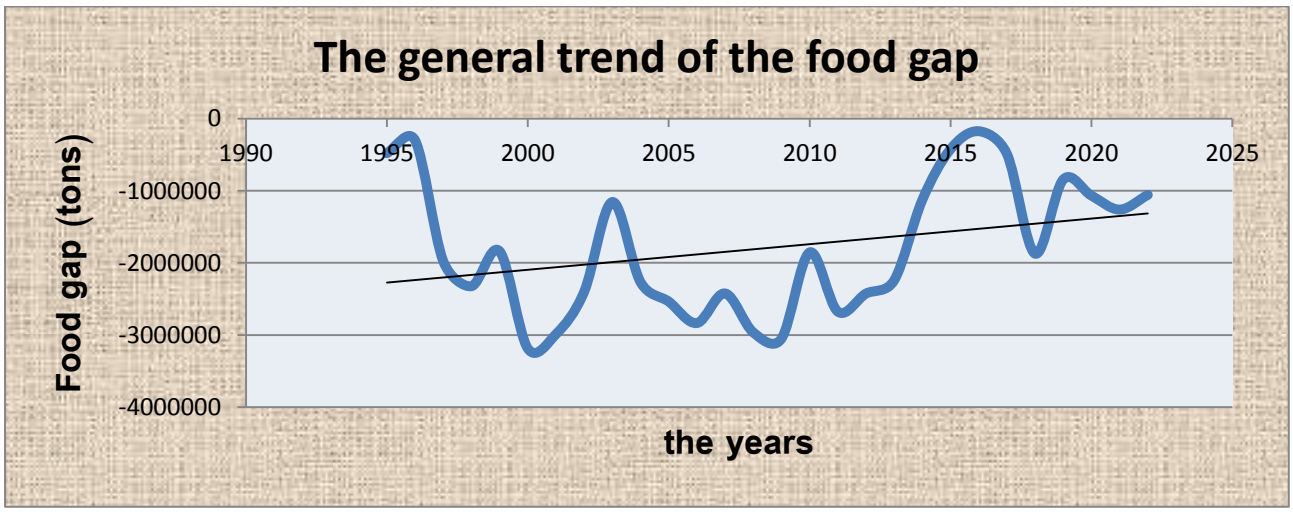

Figure (3): The general trend of the nutritional gap for the wheat crop in Iraq for the period (1995 - 2022)

With regard to the self-sufficiency rate, which is (production / consumption * 100), it was found that Iraq did not reach self-sufficiency throughout the study period, as its rate reached a maximum of (94.57604%) in the year (2016) due to the trend in interest in this crop, which led To increase production and productivity during this year, the minimum reached (24.62004%) in the year (2000) due to water scarcity. Also, this year witnessed the highest

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level of the food gap, while the average self-sufficiency reached (58.76014%), meaning that it is heading to rise as production increases. Local and less import

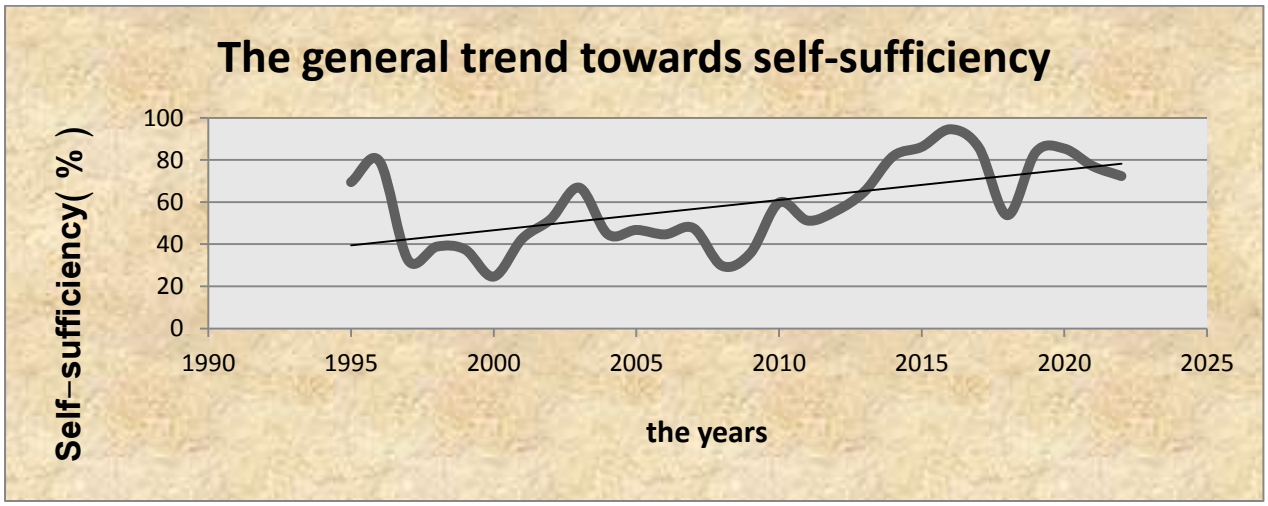

Figure (4): The general trend of wheat crop self-sufficiency in Iraq for the period (1995 - 2022)

The third section: Economic and econometric analysis of the wheat crop consumption function in Iraq during the period (1995 - 2022)

First - Description of the mathematical model used: The mathematical model of the crop consumption function (wheat) was described for the variables used in the model. Several variables were used and many attempts were made to reach the best results through the use of formulas (linear and double logarithmic). The double logarithmic formula was adopted for the variables because it gave the best results. Results.

Second - Testing the stability of the time series of variables (time series unit root test)

The unit root test aims to examine the properties of the time series for each of the consumption function variables under study and to ensure the stability of the economic time series and determine the integration ranks for each variable. Figure (5) shows the results of stability by the Extended Dickey-Fuller (ADF) method for the consumption function variables, where the hypothesis states The null (H0:b=0) indicates the instability of the time series, as opposed to the alternative hypothesis (H1:b≠0) which states the stability of the time series, and the results of the function indicate the instability of the time series at the level of the variables (lnx1, lnx2, lnx3, lnx4, lnx5), and these series became stable at the first difference, I(1), and significant at (1%). As for the variable ((lnq), it was stable at the level I(0), and at a significance level (1%), as this indicates The option of accepting the alternative hypothesis (H1:b≠0), which states that the series of consumption function variables are stable and do not include a unit root, and rejecting the null hypothesis (H0:b=0), which claims that the time series is unstable, and given the stability of some variables of this model at the level and some In the second case, the autoregressive ARDL model (with slow or distributed time lags) was adopted because it is used in the event of an imbalance in the degree of stability of the variables used.

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UNIT ROOT TEST RESULTS TABLE (ADF)
Null Hypothesis: the variable has a unit root

At Level

		LNQ	LNX1	LNX2	LNX3	LNX4	LNX5
With Constant	t-Statistic	-4.8855	-2.1936	-2.5718	-2.2764	-1.6454	-1.4600
	Prob.	*0.0006*	*0.2130*	*0.1110*	*0.1863*	*0.4465*	*0.5380*
		***	n0	n0	n0	n0	n0
With Constant & Trend	t-Statistic	-4.4772	-3.9214	-2.8692	-1.0829	-1.8658	-1.8651
	Prob.	*0.0076*	*0.0256*	*0.1872*	*0.9136*	*0.6441*	*0.6445*
		***	**	n0	n0	n0	n0
Without Constant & Trend	t-Statistic	0.5539	0.4344	0.1019	2.0995	-0.0914	8.3010
	Prob.	*0.8295*	*0.8008*	*0.7067*	*0.9893*	*0.6430*	*1.0000*
		n0	n0	n0	n0	n0	n0

At First Difference

		d(LNQ)	d(LNX1)	d(LNX2)	d(LNX3)	d(LNX4)	d(LNX5)
With Constant	t-Statistic	-4.4751	-5.6064	-5.1907	-4.9428	-4.2849	-6.2382
	Prob.	*0.0016*	*0.0001*	*0.0003*	*0.0005*	*0.0027*	*0.0000*
		***	***	***	***	***	***
With Constant & Trend	t-Statistic	-4.7796	-5.5049	-5.3039	-5.4496	-4.1763	-6.6718
	Prob.	*0.0039*	*0.0008*	*0.0012*	*0.0008*	*0.0153*	*0.0000*
		***	***	***	***	**	***
Without Constant & Trend	t-Statistic	-4.4935	-5.3946	-5.2688	-4.4246	-4.1032	-0.9270
	Prob.	*0.0001*	*0.0000*	*0.0000*	*0.0001*	*0.0002*	*0.3049*
		***	***	***	***	***	n0

Notes:
a: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1% and (no) Not Significant
b: Lag Length based on SIC
c: Probability based on MacKinnon (1996) one-sided p-values.

Figure (5) Unit root test using the Expanded Dickey-Fuller (ADF) method for wheat in Iraq (1995-2022)

Source: Prepared by the researchers based on the statistical program (Eviews12).

After ensuring the stability of the variables at the level and at the first difference, we initially estimate the (ARDL) autoregressive distributed slowdown model using the statistical program (Eviews12), which automatically determines the optimal slowdown period according to the Akaek (AIC) criterion, and through Figure (6) that the value The adjusted coefficient of determination (Adjusted R2) is equal to (0.930990), meaning that the independent variables included in the model and the estimated function explain about (93%) of the changes in the dependent variable, and this is an indication that the explanatory factors have a greater impact on the function, while (7%) do not The variables not included in the model, which are represented by the random variable, are explained and responsible. As for the calculated (F) test value, it is equal to (44.84461) and has a significant degree equal to (0.000), which is less than (0.05) and even less than (0.01). This means that the estimated model is significant as a whole. This model can be relied upon in the future planning and forecasting process.

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Dependent Variable: LNQ
Method: ARDL
Date: 01/14/24 Time: 23:45
Sample (adjusted): 1996 2022
Included observations: 27 after adjustments
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (1 lag, automatic): LNX1 LNX2 LNX3 LNX4 LNX5
Fixed regressors: C
Number of models evalulated: 32
Selected Model: ARDL(1, 0, 0, 0, 1, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNQ(-1)	-0.040369	0.078005	-0.517515	0.6111
LNX1	0.524211	0.063246	8.288447	0.0000
LNX2	0.305358	0.029740	10.26761	0.0000
LNX3	0.205887	0.095391	2.158344	0.0447
LNX4	-0.316701	0.111691	-2.835512	0.0110
LNX4(-1)	0.149078	0.110891	1.344364	0.1955
LNX5	2.415669	1.258947	1.918801	0.0710
LNX5(-1)	-2.664662	1.293628	-2.059837	0.0542
C	4.650197	2.024632	2.296811	0.0338

R-squared	0.952224	Mean dependent var	15.26601
Adjusted R-squared	0.930990	S.D. dependent var	0.322473
S.E. of regression	0.084713	Akaike info criterion	-1.837898
Sum squared resid	0.129173	Schwarz criterion	-1.405952
Log likelihood	33.81162	Hannan-Quinn criter.	-1.709458
F-statistic	44.84461	Durbin-Watson stat	1.852627
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

Figure (6) Preliminary test results of the autoregressive distributed lag (ARDL) model for the wheat crop in Iraq for the period (1995-2022)

Source: Prepared by the researchers based on the statistical program (Eviews12).

Fourth: Co-integration test using the limits test for wheat crop production in Iraq for the period (1995-2022).

To ensure the existence of co-integration, which indicates a long-term balanced relationship between the model variables, the bounds testing approach was used. This method relies on the F-Statistic test, where the null hypothesis (H0:b=0) is tested. The lack of cointegration between the independent variables in the model is offset by the alternative hypothesis (H1:b≠0) that there is cointegration between the independent variables, as it is clear from Figure (7) that the F-statistic of (33.68868) was higher than the upper limit of the critical values. In the model, which was obtained from the table proposed by Pesaran at al, 2001) at significant levels (1%, 2.5%, 5%, 10%), thus indicates that at each of the four levels of significance, we will reject the null hypothesis (H0:b=0) and accept the alternative hypothesis (H1:b≠0), which is the presence of cointegration—a long-term, balanced relationship—between the variables under investigation..

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F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	33.68868	10%	2.08	3
k	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15

Figure (7) results of the cointegration test using the bounds tes

Source: Prepared by the researchers based on the statistical program (Eviews12)

Fifth: Interpretation and estimation of the error correction model and the long- and short-run relationship according to the (ARDL) model:

After confirming the existence of a long-run equilibrium relationship (co-integration), we find the short- and long-run relationship between the variables, as we notice from Figure (8) that the short-run parameter of the independent variable, domestic production (X1), reached (0.524211), and this means the existence of a relationship There is a direct relationship between local production and the quantities consumed in the short term, meaning that increasing production by (1%) will lead to an increase in consumption by (0.524211%). This is consistent with the logic of economic theory and is significant at the level of (1%). As for the long term, we notice from the figure (9) The production relationship is also directly related to the consumption trend and is significant at the level of (1%), meaning that increasing production in the long run by (1%) leads to an increase in consumption by (0.524211%).

As for the short-run parameter for the independent variable import (X2), it was (0.305358). This means that there is a direct relationship between the quantities imported and the quantities consumed in the short run, meaning that increasing import by (1%) will lead to increasing consumption by (0.305358%). This is consistent with economic logic, but in the long run, we notice that the relationship between import quantities and consumption remains positive, and this variable has a significant impact at the level of (1%) in the long run.

The short-run parameter for the independent variable, the price of the alternative crop (barley It will lead to an increase in wheat consumption by (0.205887%), and this is consistent with the logic of economic theory, and that this variable has a significant impact at the level of (1%). As for the long run, we find that the effect of the alternative crop was also directly related to production, that is, the increase in its price in The long run by (1%) leads to an increase in consumption by (0.197898%). The significance of this variable has proven as it was significant at the level of (5%) in the long run.

As for the short-run parameter for the independent variable, the world price (X4), it amounted to (0.316701 -), and this means that there is an (inverse) relationship between the world price of the wheat crop and consumption in the short run, meaning that an increase in the world price by (1%) will lead to a decrease in consumption by (0.316701%), and this is consistent with the logic of economic theory. As for the long run,

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we notice that the inverse relationship remains between the world price and consumption, meaning that an increase in the world price by (1%) leads to a decrease in consumption by (0.161119%), and this variable has a significant effect at the level (5%).

The short-run parameter for the independent variable population (X5) was (2.415669), and this means that there is a direct relationship between population and consumption in the short run, meaning that increasing the population by (1%) will lead to an increase in consumption by (2.415669%), and this It agrees with the logic of economic theory, but in the long run the relationship has become inverse between population and consumption, meaning that an increase in population by (1%) leads to a decrease in consumption by (0.239331%), and this is contrary to economic logic, and this variable did not show its effect in the model, The fact that the wheat crop has become one of the necessary food commodities for human consumption and that any increase or decrease in population numbers or prices of this commodity does not lead to a decrease in the quantities consumed or the exclusion or dispensation of this crop because of its great nutritional importance and its involvement in various basic areas of human nutrition.

ARDL Long Run Form and Bounds Test
Dependent Variable: D(LNQ)
Selected Model: ARDL(1, 0, 0, 0, 1, 1)
Case 2: Restricted Constant and No Trend
Date: 01/15/24 Time: 00:35
Sample: 1995 2022
Included observations: 27

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.650197	2.024632	2.296811	0.0338
LNQ(-1)*	-1.040369	0.078005	-13.33723	0.0000
LNX1**	0.524211	0.063246	8.288447	0.0000
LNX2**	0.305358	0.029740	10.26761	0.0000
LNX3**	0.205887	0.095391	2.158344	0.0447
LNX4(-1)	-0.167623	0.079952	-2.096560	0.0504
LNX5(-1)	-0.248993	0.273219	-0.911329	0.3742
D(LNX4)	-0.316701	0.111691	-2.835512	0.0110
D(LNX5)	2.415669	1.258947	1.918801	0.0710

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Figure (8): Results of testing the short-term relationship to wheat crop consumption in Iraq (1995-2022).

Source: Prepared by the researchers based on the statistical program (Eviews12)

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNX1	0.503871	0.055018	9.158210	0.0000
LNX2	0.293509	0.026721	10.98442	0.0000
LNX3	0.197898	0.090207	2.193822	0.0416
LNX4	-0.161119	0.076299	-2.111684	0.0490
LNX5	-0.239331	0.263211	-0.909276	0.3752
C	4.469758	1.905688	2.345482	0.0307

EC = LNQ - (0.5039*LNX1 + 0.2935*LNX2 + 0.1979*LNX3 -0.1611*LNX4 -0.2393*LNX5 + 4.4698)

Table (9) Results of the long-term relationship test for wheat crop consumption in Iraq (1995-2022).

Source: Prepared by the researchers based on the statistical program (Eviews12)

Table (10) shows that the error correction parameter (CointEq(-1)), which is symbolized in the equation (**λ**), came in at a value of (1.040369-) with a significance less than (1%). This means that (1%) of the imbalance In the wheat consumption function, it can be corrected towards the long-term relationship, and it is a correction rate that is relatively high and acceptable towards returning to the equilibrium situation, meaning that local production of wheat takes approximately (10) ten months towards its equilibrium value of 10 ~ 100.96119 = 1/1.040369 and that the correction parameter An error when it has a negative sign will increase the validity and accuracy of the equilibrium relationship in the long run.

ARDL Error Correction Regression
Dependent Variable: D(LNQ)
Selected Model: ARDL(1, 0, 0, 0, 1, 1)
Case 2: Restricted Constant and No Trend
Date: 01/15/24 Time: 00:43
Sample: 1995 2022
Included observations: 27

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNX4)	-0.316701	0.075977	-4.168355	0.0006
D(LNX5)	2.415669	0.466019	5.183629	0.0001
CointEq(-1)*	-1.040369	0.058671	-17.73211	0.0000

R-squared	0.934324	Mean dependent var	0.032924
Adjusted R-squared	0.928851	S.D. dependent var	0.275040
S.E. of regression	0.073363	Akaike info criterion	-2.282343
Sum squared resid	0.129173	Schwarz criterion	-2.138361
Log likelihood	33.81162	Hannan-Quinn criter.	-2.239529
Durbin-Watson stat	1.852627		

* p-value incompatible with t-Bounds distribution.

Figure (10): Results of testing the error correction model for wheat crop consumption in Iraq for the (1995 - 2022)

Source: Prepared by the researchers based on the statistical program (Eviews12)

Sixth: Diagnostic tests for the ARDL model:

After the short-term and long-term relationship of the wheat consumption function has been obtained using the ARDL model, we will then evaluate the study model to determine the efficiency of the model used, through the following diagnostic tests:

1- Test Autocorrelation:

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Through this test, it is confirmed that the model is free of the problem of autocorrelation (serial correlation between values) using the (Breusch-Godfrey Serial Correlation LM) test, as Figure (11) shows that the model does not suffer from the problem of autocorrelation, as the value of the (F) statistic It reached (0.363704) at the probability level (0.7007), and this probability level is greater than (5%), and the value of (Obs*R-Squared) corresponding to it reached (1.174120) at the probability level (0.5560), which is also greater than (5%), including We accept the null hypothesis that there is no autocorrelation problem.

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	0.363704	Prob. F(2,16)	0.7007
Obs*R-squared	1.174120	Prob. Chi-Square(2)	0.5560

Figure (12): Breusch-Godfery Serial correlation LM Test results

Source: Prepared by the researchers based on the statistical program (Eviews12)

2- Heteroskedasticity Test

Through this test, it is confirmed that the model is free of the problem of non-stationarity of homogeneity of variance using the Breusch-Pagan-Godfrey Heteroskedasticity Test: Figure (13) shows that the model does not suffer from the problem of non-stationarity of homogeneity of variance because the value of the F statistic) reached (1.229868) at a probability level of (0.3375), which is a probability level greater than (5%), and the corresponding (Obs*R-Squared) value reached (9.542443) at a probability level of (0.2986), which is also greater than (5%). We can accept the null hypothesis which states that there is no problem of heterogeneity of variance.

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	1.229868	Prob. F(8,18)	0.3375
Obs*R-squared	9.542443	Prob. Chi-Square(8)	0.2986
Scaled explained SS	2.543795	Prob. Chi-Square(8)	0.9597

Figure (13): Breusch-Pagan-Godfrey Heteroskedasticity Test: for the hypothesis of non-stationarity of homogeneity of variance.

Source: Prepared by the researchers based on the statistical program (Eviews12)

3 - Testing the suitability of the model in terms of the functional form,(Ramsey RESET Test)

It is clear through the Ramsey reset test to know the suitability of the model in terms of the nature of the functional form. It is clear from Figure (14) that the value of the (F) statistic reached (0.361999) at a probability level of (0.5553), which is a probability level greater than (5%).), This means that the model is acceptable, and from it we can accept the null hypothesis that the model does not

suffer from the problem of inappropriateness of the functional form.

Ramsey RESET Test
Equation: EQ01
Omitted Variables: Squares of fitted values
Specification: LNQ LNQ(-1) LNX1 LNX2 LNX3 LNX4 LNX4(-1) LNX5 LNX5(-1) C

	Value	df	Probability
t-statistic	0.601663	17	0.5553
F-statistic	0.361999	(1, 17)	0.5553
Likelihood ratio	0.568903	1	0.4507

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.002693	1	0.002693
Restricted SSR	0.129173	18	0.007176
Unrestricted SSR	0.126479	17	0.007440

Figure (15): Ramsey Reset test for suitability of the model in terms of functional form.

Source: Prepared by the researchers based on the statistical program (Eviews12)

4 - Test for the normal distribution of residuals (JB) Jarque _ Bera:

The (JB) test is used for the purpose of ensuring the normal distribution of the remainders of the regression equation, as Figure (14) shows that the regression equation is normally distributed, and that the value of (JB) reached (0.745506) at a probability level of (0.688835), which is a probability level greater than (5%). Therefore, we accept the null hypothesis that the remainder of the model is normally distributed.

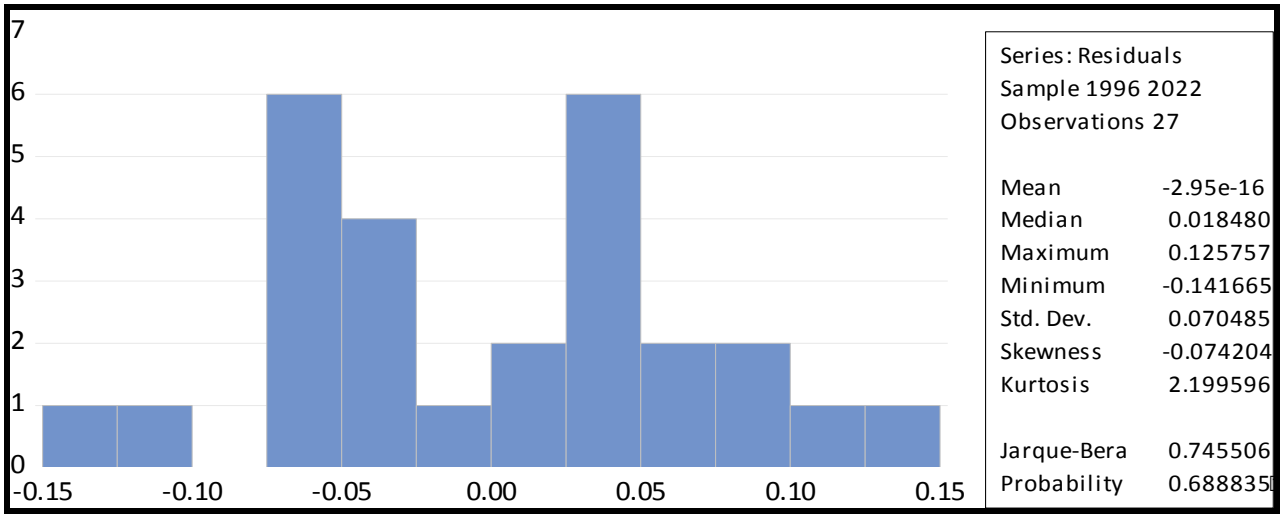

Figure (14) Jarque - Bera test for the normal distribution of residuals for wheat production.

Source: Prepared by the researchers based on the statistical program (Eviews12)

Seventh: Testing the stability of the estimated model using the CUSUM Test and CUSUM Squares Test.

Testing the structural stability of the (ARDL) model estimated for the long-run and short-run relationship, by testing the cumulative sum of residuals (CUSUM) as well as the cumulative sum of the square of residuals (CUSUM of Squares), is one of the most important tests in this field because through it two important things are clarified, namely ensuring that there is no... The data used in the study include the absence of any structural changes in it, the extent of the stability of the short-term parameters with the long-term parameters, and that these tests are

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always inherent in the autoregressive distributed lag (ARDL) model. If the graph for each of the two tests is within the framework of critical limits at the level (5%) means that all the parameters are stationary and there is no structural change in them, as Figure (15) shows the cumulative sum of the residuals, and that the graph fell within the critical limits at a significance level (5%). This means that there are no structural changes and that the short-term parameters are consistent with Long term parameters.

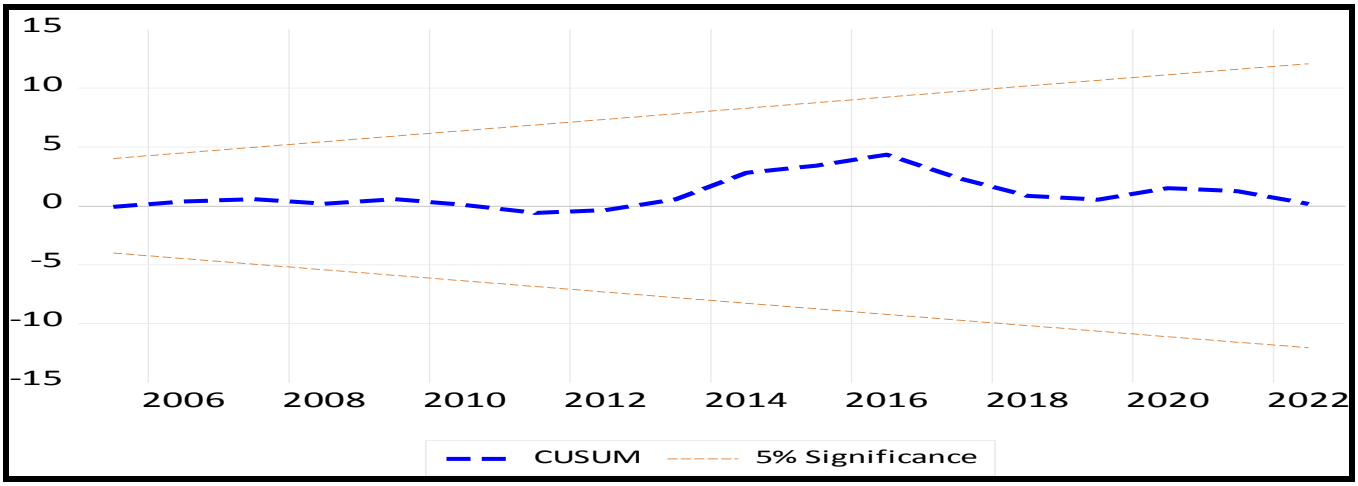

Figure (15) CUSUM test for the stability of the wheat production model.

Source: Prepared by the researchers based on the statistical program (Eviews12)

It is clear from Figure (16), the cumulative sum of the square of the residuals (CUSUM SQ), that the parameters were stable during the period under study, but they went outside the critical limits at the level of (5%) from the beginning of the year (2012) and continued until the end of the year (2014), and this It indicates structural changes in wheat crop consumption during that period from the beginning of the year (2012) to the end of the year (2014).

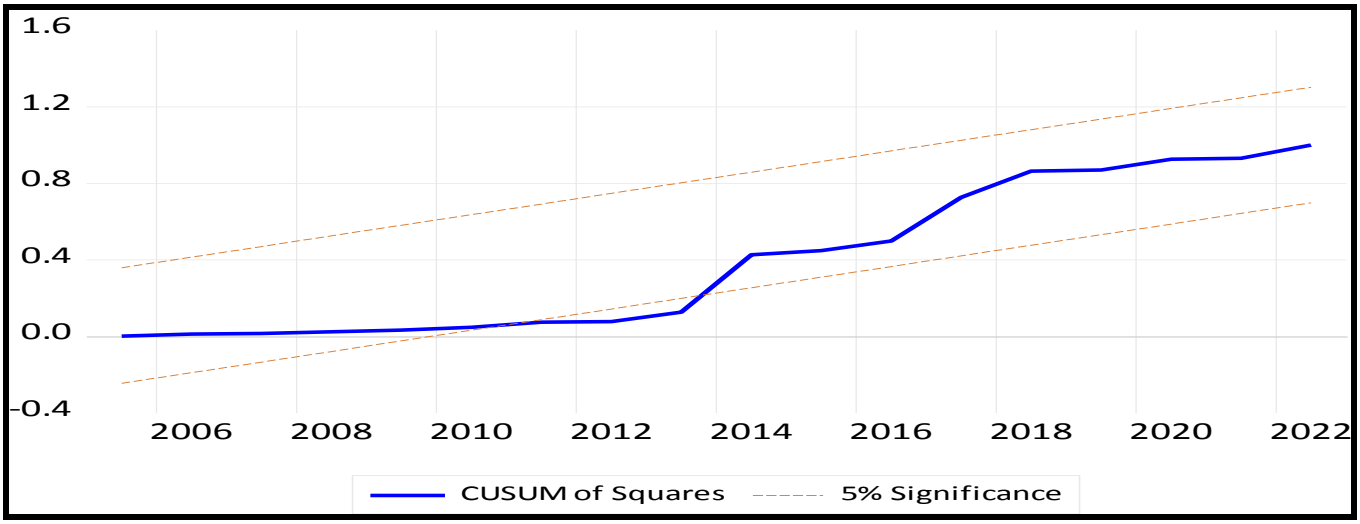

Figure (16) CUSUM SQ test for the stability of the wheat crop production model.

Source: Prepared by the researchers based on the statistical program (Eviews12)

Conclusions and recommendations

First: conclusions

1. During the study period, there were fluctuations in the amounts of wheat crop consumed, which resulted in the emergence of a food gap between production and consumption due to the fluctuations to which agricultural production is exposed. However, this gap began to close as a result of openness to foreign markets and allowing foreign products to compete with their Iraqi counterparts without being subject to customs control, which turned Iraq into a market for the disposal of excess foreign agricultural production.

2. Based on the data at our disposal and the findings of the coefficients employed in the analysis of the consumer policy function, it appears that the nation produces too little wheat, and that what is produced is not enough to satisfy the demand of consumers.

3. The results of the research showed a decrease in local production, corresponding to an increase in the quantities consumed due to population growth and increased per capita income. This led to the inability or ability of local production to keep pace with the increasing demand for the wheat crop, and a food gap arose between production and consumption, and the crop was unable to achieve Self-sufficiency.

4- The results of the econometric analysis showed that the world price variable on the consumer function had a significant impact and had an inverse (negative) relationship between the world price and consumption. It is consistent with economic logic, meaning that the rise in the global price of wheat leads to a decrease in the quantities consumed.

Second: Recommendations

1. The necessity of providing the crop (wheat) in Iraqi markets to compensate for the shortfall in local production, by importing from foreign countries to fill the deficit occurring in local markets as a result of the increase in population in exchange for a decrease in the quantities produced locally.

2- Promoting the crop by announcing the state's purchase prices for the crop (wheat) before the start of the planting season. It acts as an incentive for farmers to increase their cultivated areas, whether vertically or horizontally, which encourages the entry of new producers into the production process, and ultimately reduces quantities. Imported to meet market desires while increasing production and achieving self-sufficiency.

3- The study recommends increasing investment in the agricultural sector and working to grant soft agricultural loans, and the necessity of exploiting these loans in the field of wheat cultivation.

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Appendices

Data used to estimate a consumption function for the wheat crop in Iraq for the period (1995-2022).

Population (thousand people)	International price ($)	Price of the alternative crop barley (diet)	Import (tons)(	Production (acres)	
X5	X4	X3	X2	X1	
20536	176.96	60000	480000	1091416	1995
21124	197.23	75000	300000	1149998	1996
22046	149.51	70000	1975000	946711	1997
22702	114.46	100000	2326000	1474869	1998
23382	98.26	115000	1840600	1101598	1999
24086	100.74	152000	3185200	1040326	2000
24813	106.37	116000	3000000	2219446	2001
25565	132.17	133000	2417464	2589467	2002
26340	131.92	150000	1276667	2329198	2003
27139	134.39	160000	2501412	1832138	2004
27963	129.67	200000	2535520	2228362	2005
28810	169.14	203000	2838813	2286311	2006
29682	231.18	221000	2423713	2202777	2007
32105	292.97	350000	2963320	1254975	2008
31664	192.11	416000	3050409	1700390	2009
32481	195.23	450000	1854525	2748840	2010
33330	280.28	468000	2674720	2808900	2011
34208	276.33	479000	2425381	3062311	2012
35096	265.69	483000	2241683	4178379	2013
36005	242.9	434000	1126009	5055111	2014
35213	185.87	422000	423744	2645061	2015
36169	143.3	369000	175087	3052939	2016
37140	145.29	357000	488187	2974136	2017
38124	186.13	369000	1872604	2177885	2018
39128	163.26	459000	845000	4343000	2019
40150	164.75	466000	1068000	6238000	2020
41190	171.38	381000	1261870	4234000	2021
42248	177.69	397000	1058290	2765000	2022

Source: Republic of Iraq, Ministry of Planning, Central Bureau of Statistics, Directorate of Agricultural Statistics, Statistical Collection for the Period (1995-2022). International Monetary Fund https://data.imf.org, for the period (1995-2022).

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